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Raw Data File 2026-20



DGGS geologist Dr. Rainer Newberry on a traverse during the 2025 field season.

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Alaska Division of Geological & Geophysical Surveys (DGGS)

3354 College Road | Fairbanks, Alaska 99709-3707

Phone: 907.451.5010 | Fax 907.451.5050

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Geochemical data from samples collected in 2025 for the Steese and Tolovana projects, Yukon–Tanana Upland, Alaska

Jamshid A. Moshrefzadeh¹, Michael L. Barrera¹, J. Wesley Buchanan¹, Travis J. Naibert¹, Rainer J. Newberry¹, Lily P. Norwood¹, Sean P. Regan^{2,3}, David J. Szumigala¹, Evan Twelker¹, Sandra L. Walser¹, and Kelly R. Wilson¹

INTRODUCTION

This report presents major-oxide and trace-element geochemistry of igneous, metamorphic, and potentially mineralized rocks collected during DGGS' 2025 field season for the Steese and Tolovana projects as part of 1:100,000-scale bedrock geologic mapping within the Yukon–Tanana Upland of eastern Interior Alaska. This mapping covered parts of the Big Delta, Circle, Fairbanks, and Livengood quadrangles, an area identified by the U.S. Geological Survey's Earth Mapping Resources Initiative (USGS Earth MRI) as a priority for modernizing geologic mapping and evaluating regional favorability for rare-earth elements (REEs) and both critical and non-critical mineral resources. The geologic area of interest has experienced episodic magmatism from the Devonian through the Cenozoic. This magmatic and deformational period is associated with gold ($\pm$ W, Te, Bi, Sb, and As) mineralization at the Fort Knox mine, Golden Summit, and other mineral deposits in the Fairbanks and Circle mining districts. The Roy Creek prospect hosts U, Th, REE, and F mineralization associated with a ca. 90 Ma peralkaline syenite stock. Magmatism during the latest Cretaceous and early Paleogene may be expressed as plutonic or hypabyssal intrusive rocks; notable intrusions of this age include the Lime Peak-Cache Mountain area (granite-related Sn-W prospects) and Table Mountain and Mount Prindle areas (Au, W) (Newberry and others, 1996; Robinson and others, 1990; Smith and others, 1987; Wiltse and others, 1995). This dataset helps refine interpretations of the region's geologic framework and supports tectonic and mineral resource studies across east-central Alaska. These data are provided as a Raw Data File and are available on the DGGS website at: <https://doi.org/10.14509/32140>.

Sampling locations are shown in figure 1. Related project data, including project-wide mapped station locations, rock descriptions, magnetic susceptibility measurements, and geochemical datasets, are provided by Buchanan and others (2025), Moshrefzadeh, Acosta, and others (2025), and Moshrefzadeh, Barrera, and others (2025). All samples collected during this project, along with associated geological materials, will be stored in the short term at the DGGS office in Fairbanks. After the project's completion, all materials will be archived at the Geological Materials Center in Anchorage and available for viewing upon request.

¹ Alaska Division of Geological & Geophysical Surveys, 3354 College Road, Fairbanks, AK 99709

² University of Alaska Fairbanks College of Natural Science and Mathematics, 1930 Yukon Dr., Fairbanks, AK 99775

³ University of Alaska Fairbanks Geophysical Institute, 900 Yukon Dr., Fairbanks, AK 99775

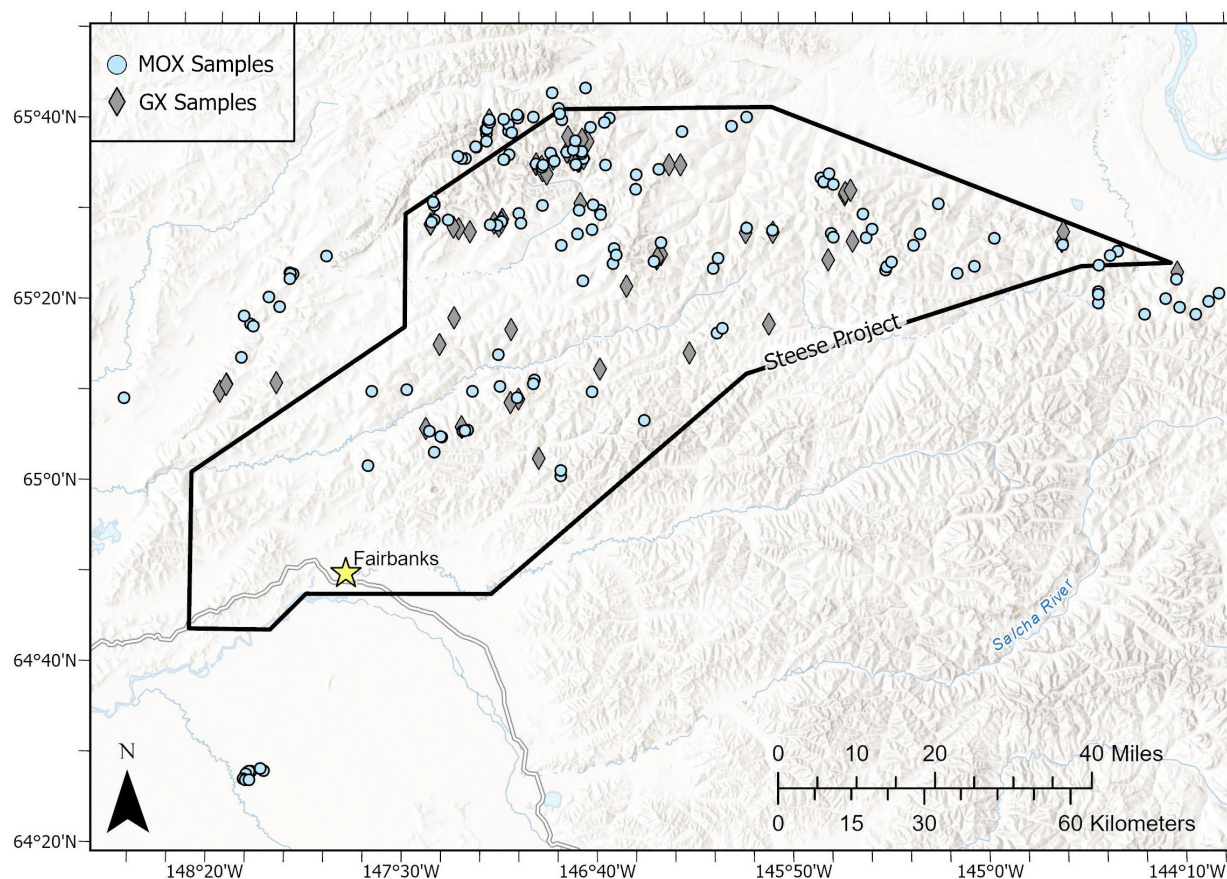


Figure 1. Station locations for 2025 samples analyzed for MOX and GX data.

SAMPLE COLLECTION METHODS

Following the methodology described in Buchanan and others (2025), the samples collected and analyzed for this report were separated into two groups based on the presence of visible mineralization or alteration: those collected for whole-rock major-oxide, minor-oxide, and trace-element analyses (MOX; $n = 193$) and those collected for trace-element geochemistry (GX; $n = 86$). MOX samples are igneous, metaigneous, or metasedimentary rocks that show little alteration or weathering. Analyzing MOX samples helps determine rock types, petrogenesis, protoliths of metamorphic rocks, and tectonic settings. In contrast, GX samples show mineralization and/or alteration, features that help determine and characterize potential mineral resources in the mapped areas. Field descriptions accompany the analytical data to facilitate comparison with the original field observations. Because these descriptions predate geochemical analyses, some lithologic designations may differ from classifications supported by the analytical results (Moshrefzadeh, Barrera, and others, 2025).

Sample Preparation

DGGS staff trimmed weathered surfaces from MOX samples to analyze fresh material only, but left GX samples untrimmed to preserve alteration and mineralization. At ALS

Geochemistry (ALS), all samples were processed and analyzed. During preparation, samples were crushed to greater than 70 percent passing 2 mm, and a 250 g split was pulverized to greater than 85 percent passing 75 microns.

ANALYTICAL METHODS

This study characterized whole-rock and trace-element geochemistry using a suite of ALS analytical routines; lab codes for each method are noted below (ALS Limited, 2023, ALS Geochemistry, 2025, ALS written commun. 2025).

MOX: The whole-rock major- and minor-oxide geochemistry package from ALS is called CCP-PKG01. It includes the following methods:

- Major and minor oxides were analyzed by lithium borate fusion, acid dissolution, and inductively coupled plasma atomic emission spectroscopy (ICP-AES; ALS method ME-ICP06).
- Trace elements, including rare earth elements, were analyzed by lithium borate fusion and inductively coupled plasma mass spectrometry (ICP-MS; ALS method ME-MS81).
- Ag, Cd, Co, Cu, Li, Mo, Ni, Pb, Sc, and Zn were analyzed by four-acid digestion and ICP-AES (ALS method ME-4ACD81).
- As, Bi, Hg, In, Re, Sb, Se, Te, and Tl were analyzed by aqua regia digestion and ICP-MS (ALS method ME-MS42).
- Ore-grade As was analyzed by four-acid digestion and ICP-AES (ALS method As-OG62).
- Total C and S were analyzed by induction furnace (ALS methods C-IR07 and S-IR08, respectively).
- Au was analyzed by fire assay with ICP-AES (ALS method Au-ICP21), and Pt and Pd by fire assay with ICP-MS (ALS method PGM-MS23).

GX: The trace element geochemistry package from ALS includes the following methods:

- Trace elements (Ag, Al, As, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Fe, Ga, Ge, Hf, In, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, Re, S, Sb, Sc, Se, Sn, Sr, Ta, Te, Th, Ti, Tl, U, V, W, Y, Zn, Zr) were analyzed by four-acid digestion and ICP-MS (ALS method ME-MS61L).
- Au was analyzed by fire assay with ICP-AES (ALS method Au-ICP21), and Pt and Pd by fire assay with ICP-MS (ALS method PGM-MS23).
- B was analyzed by sodium peroxide fusion and ICP-MS (ALS method B-MS82L).
- Sample 25MLB138 was identified as naturally occurring radioactive material (NORM), with a radioactivity level of $\sim 11 \mu\text{Sv/h}$. It was therefore isolated from the other samples and processed in ALS's NORM facilities. Because the NORM policy does not include fire assay, this sample could not be analyzed for Au or PGMs (ALS methods Au-ICP21 and

PGM-MS23). Over-limit Ce, Dy, Gd, La, Nd, Pr, and Sm in this sample were reanalyzed by fusion and ICP-AES (ALS method ME-OGREE). Over-limit U and Y were reanalyzed by lithium borate fusion, dilution, and ICP-MS (ALS methods U-DILMS81 and Y-DILMS81, respectively).

Over-limits: Samples that exceeded detection limits for elements of interest were reanalyzed using targeted methods. Over-limit As was reanalyzed by four-acid digestion and ICP-AES (ALS method ME-OG62), and over-limit Ba by sodium peroxide fusion and ICP-AES (ALS method ME-ICP81). Sample 25Z365 contained visible gold in hand sample, so it was further analyzed by fire assay with a gravimetric finish (ALS method Au-GRA21).

In addition to ALS Geochemistry's internal quality control program, DGGs submitted one blind reference material standard for every 20 unknown samples for further quality control. The geochemical results of each sample in the data tables accompanying this report contain either analytical values corresponding to the chemical composition of the sample or coded-value placeholders (null = not analyzed; -1 = the element's assay result is below the lower detection limit; -2 = the element's assay result exceeds the upper detection limit).

Please note that 24 samples in a submittal bag were mistakenly analyzed for GX rather than MOX. These samples (see table 1) were subsequently reanalyzed with the correct MOX routine. For completeness, we present the results from both routines for these samples.

Table 1. List of samples for which both trace and rare-earth elements and major oxides data are presented.

Sample ID
25CMT079
25JAM153
25RN508
25KRW291
25RN441
25ET195
25Z350.5
25JWB256
25RN507
25RN447
25RN486
25RN431
25JWB069
25RN222
25ET172
25LPN139
25LPN150
25MLB218
25LPN215
25TJN242
25Z342

Sample ID
25TJN240
25TJN230
25ET178

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